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Biological Studies
on
Turnip Yellow Mosaic Virus
in
Brassica pekinensis

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Abbreviations

- ABA - Abscisic acid
- [³H]ABA - tritiated abscisic acid
- Me-ABA - methylated abscisic acid
- ATPase - Adenosine triphosphatase
- CaMV - Cauliflower mosaic virus
- CMV - Cucumber mosaic virus
- cts/min - counts per minute
- cv - cultivar
- DNA - deoxyribonucleic acid
- GC-MS - Gas chromatography-Mass spectrometry
- ID-50 - dose infecting 50% of individuals
- m/z - mass/charge ratio
- revs/min- revolutions per minute
- RNA - ribonucleic acid
- SDS - sodium dodecyl sulphate
- SSC - standard saline citrate (0.15 M NaCl, 0.015 M Na citrate)
- T component - top component (empty protein shells)
- TMV - Tobacco mosaic virus
- TuMV - Turnip mosaic virus
- TYMV - Turnip yellow mosaic virus

Summary

1. When purified turnip yellow mosaic virus was inoculated mechanically on to Chinese cabbage leaves, using known numbers of virus particles in 0.1 to 1.0 μ l volumes of inoculum, as few as 10 to 30 particles were required to produce a single local lesion.
2. Inoculation of a cotyledon leaf of Chinese cabbage seedlings with turnip yellow mosaic virus produced a rapid transient inhibition in the rate of leaf initiation, so that infected plants developed 0.5 to 1.0 leaf less than healthy plants.
3. The factor that initiated the inhibitory response at the apical meristem began moving out of the inoculated cotyledon within 1 to 6 hours after inoculation, thus preceding the movement out of the inoculated cotyledon of infectious virus or RNA which was not detectable until about day 5.
4. The transient inhibition of leaf initiation occurred following inoculation with any one of three unrelated viruses, or with infectious turnip yellow mosaic virus RNA.
5. A factor eluted in an active form from the cut petioles of inoculated leaves.
6. It is necessary to inoculate with infectious virus or RNA to initiate the production of the inhibitory factor.

7. No differences were seen in the magnitude or timing of the reduced rate of leaf initiation, when the concentration of turnip yellow mosaic virus in the inoculum was varied between 1 µg/ml and 100 µg/ml.
8. Inoculation of the cotyledons of Chinese cabbage seedlings with turnip yellow mosaic virus caused a marked disturbance in the mitotic index at the apical meristem between 6 and 48 hours.
9. A reduction in the accumulation of starch in the chloroplasts of cells in the apical meristem occurred at 6 to 24 hours after inoculation of the cotyledon leaf.
10. Abscisic acid applied to the cotyledon in a single 20 µl dose, elicited a response that closely paralleled the events that took place when Chinese cabbage seedlings were inoculated with turnip yellow mosaic virus. A decrease in the rate of leaf initiation began 1 to 2 days after application and the inhibition of leaf initiation was preceded by a disturbance in the mitotic index in the apical meristem.
11. Gibberellic acid applied with the eluate from virus-inoculated leaves, was able to overcome the inhibition of leaf initiation.
12. The leaf inhibition assay in Chinese cabbage seedlings is a sensitive bioassay for abscisic acid. The minimum detectable concentration of 3×10^{-9} M is comparable to those reported for the Commelina stomatal closure bioassay which could detect 10^{-10} M abscisic acid (Ogunkanmi et al. 1973).